This invention is concerned with improved weight systems for exercise equipment.

BACKGROUND OF THE INVENTION

Many units of exercise equipment have been disclosed or put into actual use in which a cable is drawn against a resistance source by an individual exercising with the equipment. Typically, these units of equipment include a handle attached to one end of a cable with a resistance source, such as weights, attached to the other end of the cable and opposing the pulling of the cable. Different exercises can be performed by adjusting the vertical position at which the cable leaves the equipment. That adjustability, however, provides only a limited variety of exercises.

U.S. Patent No. 4,603,855 discloses exercise equipment in which the handle, grasped by the individual using the equipment, can undergo three degrees of movement as it is positioned for a selected exercise. Although such equipment provides added adjustability, whereby many more exercises are possible, the particular arrangement disclosed in this patent, which includes mounting the handle on a telescoping arm, lacks sufficient strength and stability when constructed from conventional components or becomes very expensive to manufacture when special components are used to provide greater strength and stability.

In other exercise equipment sold by Elgin Exercise Equipment Corporation of Des Plaines, Illinois, the handle grasped by the user is movable to the desired position by a trolley, which moves along a curved rod track. This equipment also provides added

facility for a variety of different exercises. However, the framework support structure of this exercise equipment, particularly the single arced bar used to relocate the egress point, also provides only limited strength and stability when constructed from conventional components or becomes very expensive to manufacture when special components are used to provide greater strength and stability. In addition, framework support structures of this type can present certain hazards to the user of the equipment. A snapped cable can emerge from the framework support structure and injure the user. Also, there is inadequate protection against inadvertent exposure of body parts, such as fingers, to certain of the internal working parts of the equipment and this too can lead to injury.

Only very light resistances can be used in this design or the framing and supports will bend and damage easily. It also requires the user to perform multiple steps to adjust the equipment for a desired exercise, particularly with regard to taking up the slack created in the cable when moving the egress point from place to place along the curved rod.

Other prior art that may be mentioned are the following U.S. Patent Nos.:

3,306,611	4,549,733	4,898,381	
5,018,725	5,102,122	5,195,937	5,725,459

However, none of these is all that relevant to the present invention.

Cable–cross units of equipment now currently available, provide a single step movable trolley that repositions an egress point along a straight bar, typically vertical in position, and typically have two such trolleys oriented side by side and spaced so a user can train in between them. Such designs do not optimize the interaction with basic human movement, do not provide a full 360-degree training environment in which to train, particularly limited in delivering resistance from training vectors overhead as well as

from below. Also, when switching from a linear track design to a curved track, cable slack and changes in length relative to the egress point and the cable end that connects to the attachment create a serious problem. To correct this problem, a counterweight system as shown in patent U.S. Patent No. 5,102,122 can be used. However, it calls for added steps to reposition the trolley due to the need to manually release the cable take-up means, unlock the trolley, move the trolley, relock the trolley and then relock the cable take-up means.

The current invention is related to the inventor's invention in U.S. Patent Application Serial No. 09/678,931, filed October 4, 2000, the contents of which are hereby incorporated herein by reference.

SUMMARY OF THE INVENTION

It is an object of this invention to provide a line of advanced pulley system exercise units of equipment which provide the user with the means to switch between a block and tackle set up (2:1 mechanical advantage system) and a direct lift set up in relation to the resistance means.

It is an object of this invention as well to allow the user to pull an attachment through a longer range and cut the incremental weight selection by half, thereby adding finer variations of resistance choices for the user to exercise with when using the 2:1 mechanical advantage system.

It is an object of this invention as well to provide the user with a 2:1 system that also reduces the inertial resistance during the execution of the outward pull, which gives a better feel to the movement and allows for higher speed training.

It is another object of this invention to provide a bilateral lifting system using multiple cables, the ends of which are directed by pulleys to positions where attachments can be connected at both ends of each cable. This allows users more choices of positions to choose from when training on a single machine, where resistance can be accomplished by inserting a single weight stack or other resistance means at the mid area of each cable.

These objects and others that will become apparent from the following specification may be achieved by exercise equipment including in one aspect a cable means attached at its distal end to a weight system, which cable means cooperates with pulley means for switching between a 2:1 mechanical advantage and a 1:1 ratio, the proximal end of the cable means being used to exert effort against the weight system. The weight system is variable. There may be a set of counterweights. The cable means that enables the user to exert force against the weight system may be a handle, strap, belt, rope, bar or leg curl.

Multiple cables nay be used and when the equipment is set to operate as a 2:1 mechanical advantage system, the proximal end of a cable may be pulled around a pulley and simultaneously a counterweight at the distal end of the cable will rest against a stop, thereby creating an anchor at the distal end and completing the 2:1 mechanical advantage system.

An economy model of the exercise equipment includes a framed housing having a curved track defining a prescribed curved path, a pair of pulleys on a movable trolley repositionable along the curved path, and having passed between them a cable, the proximal end of which is located outside the curved track and attached to a means that enables the user to exert force against the resistance, to which the distal end of the cable

is attached. The resistance may be variable. The resistance may be a set of weights. A set of counterweights may be used to act as a cable-take-up means when different egress points along the curved track are utilized.

In another aspect of the exercise equipment, a bilateral lifting system comprises multiple cables, the ends of which are directed by pulleys to a position where their ends where attachments are connected at both ends of each cable with a single weight stack at the mid area of each cable. The cables pass through a set of multiple pulleys running parallel atop the weight stack and are directed by another series of pulleys to the respective egress points of the cables.

Means for allowing the user to exercise force against a resistance may be a handle, strap, belt, rope, bar or any other means that are useful in exercising.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front view of the 2:1 mechanical advantage system.

FIG. 2 is a top view of the 2:1 mechanical advantage system.

FIG. 3A is a side view of the adjustment module of the 2:1 mechanical advantage system.

FIG. 3**B** is a front view of part of the adjustment module of the 2:1 mechanical advantage system.

FIG. 3C is a side view of part of the adjustment module of the 2:1 mechanical advantage system.

FIG. 3D is a front view of the pulley part of the 2:1 mechanical advantage system.

FIG. 4 is a front view of the bilateral lifting system.

FIG. 5 is a top view of the bilateral lifting system.

DETAILED DESCRIPTION OF THE INVENTION

FIGS. 1-3D illustrate a first aspect of the invention, i.e., the 2:1 mechanical advantage system.

FIGS. 4 and 5 illustrate a second aspect of the invention i.e., the bilateral lifting system.

It is advantageous to have a means whereby the user can easily switch between a block and tackle set up (2:1 mechanical advantage system) and a direct lift (1:1 ratio system) set up in relation to the resistance means. This adds the ability for the user to easily add stroke length to the egress end of the cable allowing the user to pull an attachment through a longer range and cuts the incremental weight selection by half, thereby adding finer variations of resistance choices for the user to exercise with when using the 2:1 mechanical advantage system. This 2:1 system also reduces the inertial resistance during the execution of the outward pull, which gives a better feel to the movement and allows for higher speed training.

FIG. 1 is a front view of the 2:1 mechanical advantage system.

FIG. 2 is a top view of the 2:1 mechanical advantage system.

FIG. 3A is a side view of the adjustment module of the 2:1 mechanical advantage system.

FIG. 3**B** is a front view of part of the adjustment module of the 2:1 mechanical advantage system.

FIG. 3C is a side view of part of the adjustment module of the 2:1 mechanical advantage system.

FIG. 3D is a front view of the pulley part of the 2:1 mechanical advantage system.

As far as possible, the reference numbering of the FIGS. follows that used in U.S. Patent Application Serial No. 09/678,931, filed October 4, 2000.

In FIG. 1, frame 41 of exercise equipment 40 provides means for other components of the equipment to be attached. The 2:1 mechanical advantage connector means is shown in FIGS. 1 and 3A as a rod-type pin could instead be a rod, bar, latch, switch or other type of connector means 1. Connector means 1 is inserted through a rod, bar, latch, switch or other type of cable linking means 2, which links cable 9.1 with cable 15.1 by two swaged balls 3 (or rod, bar, latch, switch or other type of other connector means) attached to the ends of cables 9.1 and 15.1, and then inserted into a rod, bar, latch, switch or other type of connector means 4. By inserting pin 1 through connector means 2 and connector means 4 which is attached to the pulley support 6 which is attached by the pulley bolt 11 inserted into lift stem 23 to make the connection with the resistance means 13, which is shown here as a weight stack.

When pin 1 is inserted through a rod, bar, latch, switch or other of type of connectors 2 and 4 and the user pulls on the attachment at the egress point of the cable, the weight stack is lifted with a 1:1 ratio of resistance. The cable slack created by cable 15.1 is taken up by a counter weight 16.1 connected at the distal end of cable 15.1 as it travels over redirectional pulleys 18.1 above, allowing it to drop into guide shaft 16.2.

When pin rod, bar, latch, switch or other type of connector 1 is removed, the lifting system turns into a 2:1 mechanical advantage block and tackle system. When an

exercise is performed, cable 15.1 is pulled around pulley 7 and, simultaneously, the counter weight 16.1 at the distal end of cable 15.1 nests against a stop block 16.3 and creates the anchor at this end to complete the 2:1 mechanical advantage system.

The cables 9 are horizontally redirected when they pass over pulleys 14.1 and then vertically downward as they pass over pulleys 14.2 where the distal ends of cables 9 are attached to counterweights 16. When the proximal end of a cable 9 is pulled, it raises the counterweights 16. A horizontal plate18 with holes, slots or other openings cut so the cables 9 pass through the plate 18 is positioned above the counterweights 16 and extended over and attached or welded to a vertically positioned guiding means, e,g., a linear bearing 18.8 (or other guiding mechanism such as a roller system, or a bushing housed in a tube traveling on a rod, bar or other vertical support) traveling along a vertical shaft 20 positioned between the weight stack 13 and the counterweights 16. Single cable 9.1 which is attached to the underside of horizontal plate 18 and to a pulley 14.3 below, then routed upward to two pulleys 14.4 above the weight stack and down to a plate 13.1 to guide the weights 13 vertically along two upright guide rods 22 extending downward through the weight stack 13 and a rod 23 extending downward through the center of the weight stack with holes 24 cut in it to allow a selector pin 25 to slide into the weight stack 13 so the user can select the desired weight to lift. When the user pulls on the cable 9 end at the point of egress, the counterweight 16 is lifted, thereby lifting the horizontal plate assembly 18 and the selected weight 13. Other cables 9 in the system that are not engaged by the user at that time are held in the ready position by their respective counterweights 16.

The distal ends of the cables 9 are attached to a counterweight 16, which travels vertically through a slot mounted in a housing with each slot and counterweight 16 positioned side by side at the end of each respective cable 9, (one counterweight 16 for each cable 9 threaded through the system) positioned next to the resistance, which in this case is a set of weights 13, and housed within a vertical set of guide tracks 17. They are positioned within the housing on the far side of the weights, but could be positioned in other arrangements relative to the resistance. Optimal positioning is next to or adjacent to the resistance. The counterweights 16 are optimally also positioned at or slightly beneath the top plane of the weight stack 16, but could be positioned above the top plate.

FIG. 4 is a front view of the bilateral lifting system.

FIG. 5 is a top view of the bilateral lifting system.

Frame 61 of a bilateral lifting system 60 uses multiple cables 62 and 63, having two ends directed by pulleys 64 to where attachments can be connected at both ends of each cable 62 and 63. Using both ends of cables 62 and 63 allows users more choices of positions to choose from when training on a single machine and can be accomplished by inserting a single weight stack 65 or other resistance means at the mid area of each cable 62 and 63. The cables 62 and 63 may pass through a set of multiple pulleys 66 running parallel atop the weight stack 65 and directed by a series of pulleys 64 to the respective egress points of cables 62 and 63. Such a system can be used in connection with the the first aspect of the current invention and can also be used in connection with other exercise equipment currently on the market such as the CYBEX FT 360 or the similar unit by Ground Zero.

The foregoing specification and drawings have thus described and illustrated novel improvements in exercise systems that fulfill all of the objects and advantages sought therefor. Many changes, modifications, variations and other uses and applications of the subject invention will, however, become apparent to those skilled in the art after considering this specification which discloses the preferred embodiments thereof. All such changes, modifications, variations and other uses and applications which do not depart from the spirit and scope of the invention are deemed to be covered by the invention, which is to be limited only by the claims which follow.